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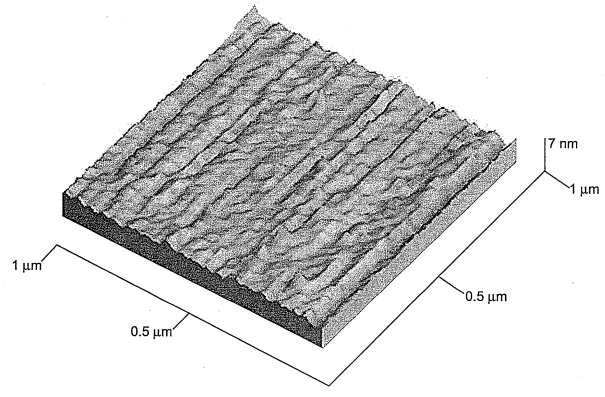
(54) Plasma etching of diamond surfaces

(57) The present invention relates to a polycrystalline CVD diamond material comprising a surface having a surface roughness Rq of less than 5 nm, wherein said surface is damage free to the extent that one or both of the following criteria are fulfilled:
(a) if an anisotropic thermal revealing etch is applied thereto, a number density of defects revealed by the anisotropic thermal revealing etch is less than 100 per mm^2; and
(b) if a backscattering ion beam analysis is applied thereto, a backscattered ion yield is less than 5% of incident ions.

FIG. 10



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EUROPEAN SEARCH REPORT

Application Number
EP 13 17 4114

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 496 564 A1 (SUMITOMO ELECTRIC INDUSTRIES [JP]) 29 July 1992 (1992-07-29) * page 3, lines 48-50 * * page 4, line 18 - page 5, line 13; figure 3 * -----	1,3,5-8	INV. C23C14/58 C23C14/02 C30B25/02 C30B29/04 H01L21/04
X	KARLSSON M ET AL: "Diamond micro-optics: microlenses and antireflection structured surfaces for the infrared spectral region", OPTICS EXPRESS, vol. 11, no. 5, 10 March 2003 (2003-03-10), pages 502-507, XP002482939, OSA (OPTICAL SOCIETY OF AMERICA), WASHINGTON, DC [US] ISSN: 1094-4087 * pages 505-506 * -----	1-3,5-11 12	H01L29/16 C23C16/27 C23C16/56 C30B25/10 C30B25/20 G01N27/30 H01L21/02 H01L29/04 H01L29/36 H01L29/167
A	WO 2006/044164 A2 (GUARDIAN INDUSTRIES [US]; PETRMICHL RUDOLPH HUGO [US]; BIENKIEWICZ JOS) 27 April 2006 (2006-04-27) * paragraph [0013]; figures 1-3 * -----	1-3,5-12	TECHNICAL FIELDS SEARCHED (IPC) C23C C30B
A	PEARTON S J ET AL: "ECR PLASMA ETCHING OF CHEMICALLY VAPOUR DEPOSITED DIAMOND THIN FILMS", 23 April 1992 (1992-04-23), ELECTRONICS LETTERS, IEE STEVENAGE [GB], XP000296661, ISSN: 0013-5194 vol. 28(9), pages 822-824, DOI: 10.1049/el:19920520, * page 823 * ----- -/--	1-3,5-12	H01L

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	13 February 2014	Hoyer, Wolfgang

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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& : member of the same patent family, corresponding document

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EUROPEAN SEARCH REPORT

Application Number
EP 13 17 4114

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	LEE C L ET AL: "Fabrication and characterization of diamond micro-optics", DIAMOND AND RELATED MATERIALS, vol. 15, no. 4-8, April 2006 (2006-04), pages 725-728, XP005519337, ELSEVIER SCIENCE PUBLISHERS, AMSTERDAM [NL] ISSN: 0925-9635, DOI: 10.1016/j.diamond.2005.09.033 * the whole document * -----	1-3,5-12	

TECHNICAL FIELDS SEARCHED (IPC)

~~The present search report has been drawn up for all claims~~

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

see annex

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 13 17 4114

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 3, 5, 12(completely); 1, 2, 6-11(partially)

   A polycrystalline CVD diamond material with a surface roughness Rq of less than 5 nm and a damage-free surface to the extent that a density of defects of less than 100/mm2 is revealed by an anisotropic thermal revealing etch.

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2. claims: 4(completely); 1, 2, 6-11(partially)

   A polycrystalline CVD diamond material with a surface roughness Rq of less than 5 nm and a damage-free surface to the extent that a backscattering ion analysis reveals an ion yield of less than 5 % of incident ions.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 17 4114

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-02-2014

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		WO 2006044164 A2	27-04-2006

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